

C L A I M S

1. A method for inhibiting formation of hydrocarbon hydrates in a mixture comprising water and hydrate-forming guest molecules, the method comprising contacting the mixture with a composition which comprises at least one dendrimeric compound having a number average molecular weight of at least 1,000 atomic mass units (amu); and

at least one small molecular weight species having less than 1,000 amu, selected from the group consisting of polyalkyleneimine; polyallylamine, starch, sugars, and polymers or copolymers of vinyl alcohol or allyl alcohol, where the composition amount is effective in inhibiting formation of the hydrocarbon hydrates in the mixture.

2. The method of claim 1 where the dendrimeric compound is selected from the group consisting of branched and crosslinked polymers having at least one acyclic or cyclic pendant group containing from 3 to 7 carbon atoms, and said branched and crosslinked polymers also containing a heteroatom selected from the group consisting of N, O, and S, and mixtures thereof.

3. The method of claim 2, in which the dendrimeric compound is a condensation polymer containing ester groups and at least one amide group in the backbone, having at least one hydroxyalkylamide end group and having a number average molecular weight of at least 1000 amu.

4. The method of any one of claims 1 to 3, in which the small molecular weight species is based on polyalkyleneimine, in particular polyethyleneimine.

5. The method of any one of claims 1 to 4, in which the small molecular weight species is modified to contain at least one acyclic or cyclic pendant group containing from 3 to 7 carbon atoms.

6. The method of any one of claims 1 to 5, in which the composition comprises at least one surfactant.

7. The method of claim 6 where the surfactant is a cationic, anionic or nonionic surfactant selected from the group consisting of polyoxyethylene ethers, sorbitans, long chain alcohols, sulphates, diols, fatty acids, alkylated ammonium compounds, phosphonium compounds, sulphonium compounds and mixtures thereof, preferably alkylated quaternary ammonium compounds.

8. The method of any one of claims 1 to 7, in which the composition comprises

from 0.1 to 2 wt% of the at least one dendrimeric compound;

from 0.1 to 2 wt% of the at least one small molecular weight species having less than 1,000 amu; and

from about 10 to about 3000 ppm of the at least one surfactant.

9. A composition for inhibiting formation of hydrocarbon hydrates which comprises at least one dendrimeric compound having a number average molecular weight of at

least 1,000 atomic mass units (amu); and

at least one small molecular weight species having less than 1,000 amu, selected from the group consisting of polyalkyleneimine, polyallylamine, starch, sugars, and polymers or copolymers of vinyl alcohol or allyl alcohol.

10. The composition of claim 9 in which the dendrimeric compound is selected from the group consisting of branched and crosslinked polymers having at least one acyclic or cyclic pendant group containing from 3 to 7

carbon atoms, and said linear, branched and crosslinked polymers also containing a heteroatom selected from the group consisting of N, O, and S, and mixtures thereof.

11. The composition of claim 10, in which the dendrimeric compound is a condensation polymer containing ester groups and at least one amide group in the backbone, having at least one hydroxyalkylamide end group and having a number average molecular weight of at least 1000 amu.

12. The composition of any one of claims 9 to 11, in which the small molecular weight species is based on polyalkyleneimine, in particular polyethyleneimine

13. The composition of any one of claims 9 to 12, in which the small molecular weight species is modified to contain at least one acyclic or cyclic pendant group containing from 3 to 7 carbon atom

14. The composition of any one of claims 9 to 13, in which the composition comprises at least one surfactant.

15. The method of claim 14, in which the surfactant is a cationic, anionic or nonionic surfactant selected from the group consisting of polyoxyethylene ethers, sorbitans, long chain alcohols, sulphates, diols, fatty acids, quaternary ammonium compounds and mixtures thereof.

16. The composition of any one of claims 9 to 15, in which the composition comprises from 0.1 to 2 wt% of the at least one dendrimeric compound;

from 0.1 to 2 wt% of the at least one small molecular weight species having less than 1,000 amu; and, optionally

from about 10 to about 3000 ppm of the at least one surfactant.

17. A hydrate inhibited mixture comprising:

water,

hydrate-forming guest molecules, and

a composition where the composition comprises

5 at least one dendrimeric compound having a number average
molecular weight of at least 1,000 atomic mass
units (amu); and

at least one small molecular weight species having less
than 1,000 amu, selected from the group consisting of

10 polyalkyleneimine, polyallylamine, starch, sugars, and
polymers or copolymers of vinyl alcohol or allyl alcohol;
and, optionally, at least one surfactant,

where the composition is present in a concentration
effective to inhibit hydrate formation in the mixture.

15 18. The hydrate inhibited mixture of claim 17, in which
the hydrate-forming guest molecules are selected from the
group consisting of methane, ethane, ethylene, acetylene,
propane, propylene, methylacetylene, n-butane, isobutane,
1-butene, trans-2-butene, cis-2-butene, isobutene, butene
20 mixtures, isopentane, pentenes, natural gas, carbon
dioxide, hydrogen sulphide, nitrogen, oxygen, argon,
krypton, xenon, and mixtures thereof.